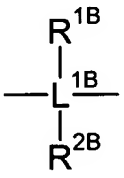
We claim:

1. A monocyclopentadienyl complex which comprises the structural feature of the formula $(Cp)(-Z-A)_mM$ (I), where the variables have the following meanings:

Cp is a cyclopentadienyl system,

Z is a bridge between A and Cp of the formula,



where

L^{1B} are each, independently of one another, carbon or silicon,

R^{1B},R^{2B} are each, independently of one another hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}_3, where the organic radicals R^{1B} and R^{2B} may also be substituted by halogens and the two radicals R^{1B} and R^{2B} and/or R^{1B} or R^{2B} and A may also be joined to form a five- or six-membered ring,

R^{3B} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{3B} may also be joined to form a five- or six-membered ring,

A is an unsubstituted, substituted or fused, five-membered heteroaromatic ring system,

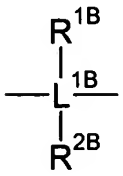
M is a metal selected from the group consisting of titanium in the oxidation state 3, vanadium, chromium, molybdenum and tungsten and

m is 1, 2 or 3.

2. A monocyclopentadienyl complex as claimed in claim 1 having the formula $(Cp)-(-Z-A)_mMX_k$ (VI), where the variables have the following meanings:

Cp is a cyclopentadienyl system,

Z is a bridge between A and Cp of the formula,



where

L^{1B} are each, independently of one another, carbon or silicon,

R^{1B},R^{2B} are each, independently of one another hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}_3, where the organic radicals R^{1B} and R^{2B} may also be substituted by halogens and the two radicals R^{1B} and R^{2B} and/or R^{1B} or R^{2B} and A may also be joined to form a five- or six-membered ring,

R^{3B} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{3B} may also be joined to form a five- or six-membered ring,

A is an unsubstituted, substituted or fused, five-membered heteroaromatic ring system,

M is a metal selected from the group consisting of titanium in the oxidation state 3, vanadium, chromium, molybdenum and tungsten,

m is 1, 2 or 3,

X are each, independently of one another, fluorine, chlorine, bromine, iodine, hydrogen, C_1-C_{10}-alkyl, C_2-C_{10}-alkenyl, C_6-C_{20}-aryl, alkylaryl having 1-10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^1R^2, OR^1, SR^1, SO_3R^1, $OC(O)R^1$, CN, SCN, β-diketonate, CO, BF_4^-, PF_6^- or a bulky noncoordinating anion,

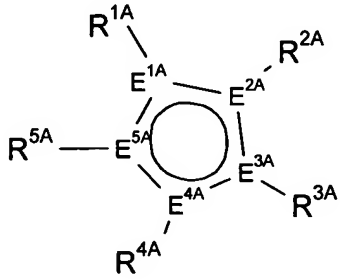
R^1-R^2 are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^3_3, where the organic radicals R^1-R^2 may

also be substituted by halogens and two radicals R^1-R^2 may also be joined to form a five- or six-membered ring,

R^3 are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^3 may also be joined to form a five- or six-membered ring and

k is 1, 2, or 3.

3. A monocyclopentadienyl complex as claimed in claim 1 or 2, wherein the cyclopentadienyl system Cp has the formula (II):



(II)

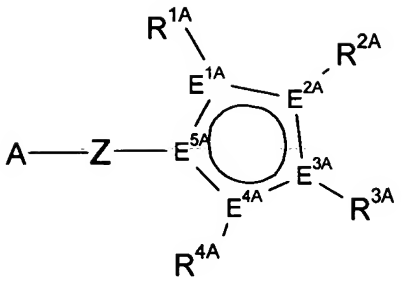
where the variables have the following meanings:

E^{1A}-E^{5A} are each carbon or not more than one E^{1A} to E^{5A} is phosphorus,

R^{1A}-R^{5A} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2, $N(SiR^{6A}_3)_2$, OR^{6A}, $OSiR^{6A}_3$, SiR^{6A}_3, BR^{6A}_2, where the organic radicals R^{1A}-R^{5A} may also be substituted by halogens and two vicinal radicals R^{1A}-R^{5A} may also be joined to form a five- or six-membered ring, and/or two vicinal radicals R^{1A}-R^{5A} are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S, with 1, 2 or 3 substituents R^{1A}-R^{5A} each being a -Z-A group and

R^{6A} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring.

4. A monocyclopentadienyl complex as claimed in any of claims 1 to 3, wherein the cyclopentadienyl system Cp together with -Z-A has the formula (IV):



(IV)

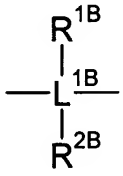
where the variables have the following meanings:

E^{1A}-E^{5A} are each carbon or not more than one E^{1A} to E^{5A} is phosphorus,

R^{1A}-R^{4A} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2, $N(SiR^{6A}_3)_2$, OR^{6A}, $OSiR^{6A}_3$, SiR^{6A}_3, where the organic radicals R^{1A}-R^{4A} may also be substituted by halogens and two vicinal radicals R^{1A}-R^{4A} may also be joined to form a five- or six-membered ring, and/or two vicinal radicals R^{1A}-R^{4A} are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S,

R^{6A} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring,

Z is a bridge between A and Cp of the formula,



where

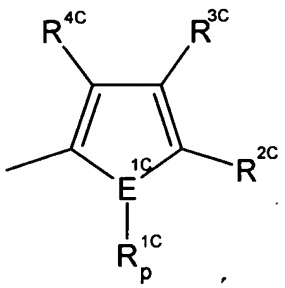
L^{1B} are each, independently of one another, carbon or silicon,

R^{1B},R^{2B} are each, independently of one another hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}_3, where the organic radicals R^{1B} and R^{2B} may also be substituted by halogens and the two radicals R^{1B} and R^{2B} and/or R^{1B} or R^{2B} and A may also be joined to form a five- or six-membered ring,

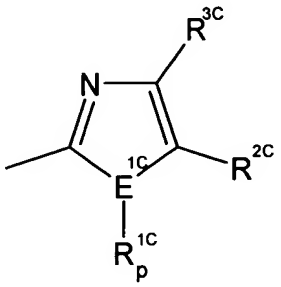
R^{3B} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{3B} may also be joined to form a five- or six-membered ring and

A is an unsubstituted, substituted or fused, five-membered heteroaromatic ring system.

5. A monocyclopentadienyl complex as claimed in any of claims 1 to 4, wherein A has the formula (IIIa) or (IIIb)



(IIIa)



(IIIb)

where

E^{1C} is nitrogen, phosphorus, sulfur or oxygen,

R^{1C}-R^{4C} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{5C}_3, where the organic radicals R^{1C}-R^{4C} may also be substituted by halogens or nitrogen or further C_1-C_{20}-alkyl groups, C_2-C_{20}-alkenyl groups, C_6-C_{20}-aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{5C}_3 and two vicinal radicals R^{1C}-R^{4C} or the two radicals R^{1C} or R^{4C} and Z may also be joined to form a five- or six-membered ring,

R^{5C} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{5C} may also be joined to form a five- or six-membered ring and

p is 0 when E^{1C} is sulfur or oxygen and 1 when E^{1C} is nitrogen or phosphorus.

6. A monocyclopentadienyl complex as claimed in any of claims 1 to 5, wherein L^{1B} is carbon.

7. A monocyclopentadienyl complex as claimed in any of claims 1 to 6, wherein Z is $-CH_2-$, $-C(CH_3)_2-$, $-CH(C_6H_5)-$ or $-C(C_6H_5)_2-$.

8. A catalyst system for olefin polymerization comprising

A) at least one monocyclopentadienyl complex as claimed in any of claims 1 to 7,

B) optionally an organic or inorganic support,

C) optionally one or more activating compounds,

D) optionally one or more catalysts suitable for olefin polymerization and

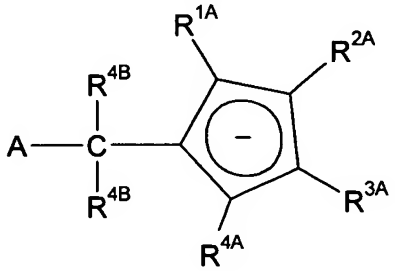
E) optionally one or more metal compounds containing a metal of group 1, 2 or 13 of the Periodic Table.

9. A prepolymerized catalyst system comprising a catalyst system as claimed in claim 8 and one or more linear C_2-C_{10}-1-alkenes polymerized onto it in a mass ratio of from 1:0.1 to 1:1 000, based on the catalyst system.

10. The use of a catalyst system as claimed in claim 8 or 9 for the polymerization or copolymerization of olefins.

11. A process for preparing polyolefins by polymerization or copolymerization of olefins in the presence of a catalyst system as claimed in claim 8 or 9.

12. A process for preparing cyclopentadienyl system anions of the formula (VII),



(VII)

where the variables have the following meanings:

R^{1A}-R^{4A} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2, $N(SiR^{6A}_3)_2$, OR^{6A}, $OSiR^{6A}_3$, SiR^{6A}_3 where the organic radicals R^{1A}-R^{4A} may also be substituted by halogens and two

vicinal radicals R^{1A}-R^{4A} may also be joined to form a five- or six-membered ring, and/or two vicinal radicals R^{1A}-R^{4A} are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S,

R^{6A} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring,

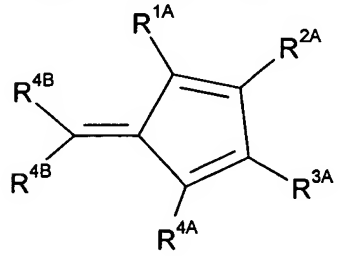
A is an unsubstituted, substituted or fused, heteroaromatic 5-membered ring system,

R^{4B} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}_3, where the organic radicals R^{4B} may also be substituted by halogens and two geminal or vicinal radicals R^{4B} may also be joined to form a five- or six-membered ring and

R^{3B} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{3B} may also be joined to form a five- or six-membered ring,

which comprises the step a) or a'), where,

in step a), an A^- anion is reacted with a fulvene of the formula (VIIIa)



(VIIIa)

or,

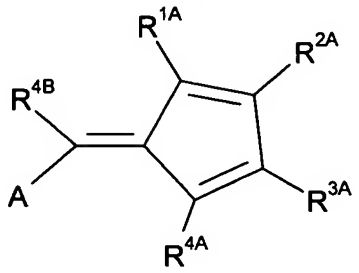
in step a'), an organometallic compound $R^{4B}M^BX^B_b$ where

M^B is a metal of group 1 or 2 of the Periodic Table of the Elements,

X^B is halogen, C_1–C_{10}–alkyl, alkoxy having from 1 to 20 carbon atoms in the alkyl part and/or from 6 to 20 carbon atoms in the aryl part, or R^{4B} and

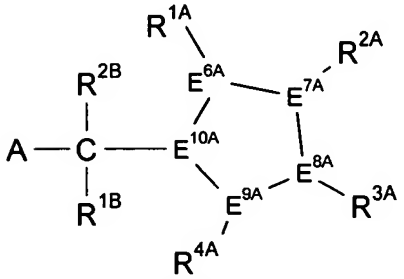
b is 0 when M^B is a metal of group 1 of the Periodic Table of the Elements and is 1 when M^B is a metal of group 2 of the Periodic Table of the Elements,

is reacted with a fulvene of the formula (VIIIb):



(VIIIb)

13. A process for preparing cyclopentadiene systems of the formula (VIIa)



(VIIa)

where the variables have the following meanings:

E^{6A}-E^{10A} are each carbon, where in each case four adjacent E^{6A}-E^{10A} form a conjugated diene system and the remaining E^{6A}-E^{10A} additionally bears a hydrogen atom,

R^{1A}-R^{4A} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2, $N(SiR^{6A}_3)_2$, OR^{6A}, $OSiR^{6A}_3$, SiR^{6A}_3, where the organic radicals R^{1A}-R^{4A} may also be substituted by halogens and two vicinal radicals R^{1A}-R^{4A} may also be joined to form a five- or six-membered ring, and/or two vicinal radicals R^{1A}-R^{4A} are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S,

R^{6A} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring,

A is an unsubstituted, substituted or fused, heteroaromatic 5-membered ring system,

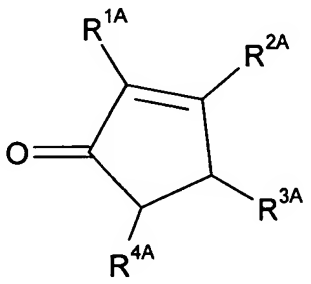
R^{1B},R^{2B} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and

6-20 carbon atoms in the aryl part or SiR^{3B}_3, where the organic radicals R^{1B} and R^{2B} may also be substituted by halogens and R^{1B} and R^{2B} and/or R^{1B} and A may also be joined to form a five- or six-membered ring,

R^{3B} are each, independently of one another, hydrogen, C_1-C_{20}-alkyl, C_2-C_{20}-alkenyl, C_6-C_{20}-aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{3B} may also be joined to form a five- or six-membered ring,

which comprises the following step:

a") reaction of an A-$CR^{1B}R^{2B-}$ anion, with a cyclopentenone system of the formula (IX)



(IX)